








LEARNING OBJECTIVES:

-  2.10.01 State the purpose of and information found on a Radiological Work Permit (RWP) including the different classifications at your site.
-  2.10.02 State responsibilities in using or initiating a RWP.
-  2.10.03 State the document that governs the ALARA program at your site.
-  2.10.04 Describe how exposure/performance goals are established at your site.
-  2.10.05 State the conditions under which a pre-job ALARA review is required at your site.
-  2.10.06 State the conditions under which a post-job ALARA review is required at your site.
- | 2.10.07 State purpose of radiological postings, signs, labels, and barricades; and the RCTs responsibilities for them.
-  2.10.08 Identify the following radiological postings at your site, requirements for posting/barriers, and requirements for entry:
 - a. Radiological Buffer Area
 - b. Radiation Area
 - c. High Radiation Area
 - d. Very High Radiation Area
 - e. Hot Spot
 - f. Surface Contamination Area
 - g. High Surface Contamination Area
 - h. Airborne Radioactivity Area
 - i. Fixed Surface Contamination
 - j. Soil Contamination
 - k. Radioactive Material Storage Area
- 2.10.09 Describe good practices, support equipment to use, and common discrepancies in setting up radiological areas.
- 2.10.10 List discrepancies frequently observed in containment devices.

- 2.10.11 Describe good practices in setting up portable ventilation systems and count rate meters.
- 2.10.12 List the requirements individuals must follow while working in RBAs.
- 2.10.13 State the requirements for removing or releasing materials from any radiological area.

INTRODUCTION

This lesson reviews Radiological Work Permits, various types of postings used in radiological areas, setting up radiological areas, access controls, and releasing of material from radiological areas.

RADIOLOGICAL WORK PERMITS (RWP)

2.10.01 State the purpose of and information found on a Radiological Work Permit (RWP) including the different classifications at your site.

(Insert site specific information here)

The RWP is an administrative mechanism used to establish radiological controls for intended work activities. The RWP informs workers of area radiological conditions and entry requirements and provides a mechanism to relate worker exposure to specific work activities. The RWP should include the following information:

- Description of work
- Work area radiological controls
- Dosimetry requirements
- Pre-job briefing requirements, as applicable
- Training requirements for entry

- Protective clothing and respiratory protection requirements
- Radiological control coverage requirements and stay time controls, as applicable
- Limiting radiological conditions that may void the RWP
- Special dose or contamination reduction considerations
- Special personnel frisking considerations
- Technical work document number, as applicable
- Unique identifying number
- Date of issue and expiration
- Authorizing signature

Radiation Work Permits are required for activities such as entry into High or Very High Radiation Areas, entry into High Contamination Areas, or any entry into Airborne Activity Areas.

Other activities that might require the use of a RWP include entry into Radiation Areas, entry into Contamination Areas, or handling of materials with removable contamination that exceeds the values in Table 2-2.

2.10.02 *State responsibilities in using or initiating a RWP.*

(Insert site specific information here)

Workers accessing an area permitted by an RWP shall be required to sign the RWP or log prior to initial entry and after any revisions to the RWP. Signing the RWP or log signifies that the worker has read it, is aware of the radiological conditions, understands the requirements, and agrees to comply with the requirements.

There are basically two different types of RWPs, Job-specific and General. General RWPs govern routine or repetitive work where radiological conditions are stable such as inspections, surveillance, surveys, and tours. General RWPs may be used to govern specific maintenance and operations when such jobs do not involve work with elevated or complex radiological conditions. General RWPs are typically only valid for one year. Job-specific RWPs are used to control nonroutine operations or work in areas with changing radiological conditions. Job-specific RWPs usually remain in effect only for the duration of the job.

ALARA CONSIDERATIONS FOR ACCESS CONTROL AND WORK AREA SETUP

Exposure to ionizing radiation is typically quantified, tracked, and controlled in terms of the dose equivalent workers receive, or could potentially receive, in given situations. Management policy is to maintain radiation exposure of employees, subcontractors, visitors and members of the general public not only within applicable DOE and administrative limits, but "As Low as Reasonably Achievable."

2.10.03 *State the document that governs the ALARA program at your site.*

Documentation

(Insert site specific information here)

2.10.04 *Describe how exposure/performance goals are established at your site.*

Exposure/Performance Goals

(Insert site specific information here)

PRE-JOB ALARA REVIEWS

Pre-job meetings are held with employees who will be involved in work activities involving unusual radiological conditions. These meetings allow an open discussion of all the factors identified as effective dose reduction measures. HP needs are communicated to workers. Worker needs are communicated to HP. Procedures are verified, worker qualifications are verified, and what they do in an emergency is discussed. At the end of the meeting, everyone should know what is expected of them, how to do it, and the conditions under which it is to be done.

Pre-job briefings are usually conducted by the cognizant work supervisor and as a minimum, the pre-job briefings shall include:

- scope of work to be performed
- radiological conditions of the workplace
- procedural and RWP requirements
- special radiological control requirements
- radiologically limiting conditions, such as contamination or radiation levels that may void the RWP
- Health Physics/Radiological Control Hold Points
- communications and coordination with other groups
- provisions for housekeeping and final cleanup
- consideration of potential accident situations or unusual occurrences and a review of abnormal and emergency procedures and plans
- emergency response provisions.

2.10.05 *State the conditions under which a pre-job ALARA review is required at your site.*

Site requirements for pre-job reviews:

(Insert site specific information here)

POST-JOB ALARA REVIEWS

Post-job meetings allow the opportunity to critique the work performance. Although they will not affect the dose already received for a particular job, they can be effective in reducing the doses received the next time that job is performed.

As a minimum, the post-job ALARA review shall include the following, as applicable:

- Any changes/modifications made to original work instructions.
- Time required to perform the job.
- Resources required for job.
- Estimated collective dose versus actual collective dose summary.
- Effectiveness of exposure controls implemented.
- Problems encountered and solutions.
- Abnormal events/situations causing the use of stop work.
- Lessons learned.
- Actions taken to prevent recurrence of problems or situation.

2.10.06 *State the conditions under which a post-job ALARA review is required at your site.*

Site requirements for post-job reviews:

(Insert site specific information here)

RADIOLOGICAL POSTINGS

2.10.07 *State purpose of all radiological postings, signs, labels, and barricades; and the RCTs responsibilities for them.*

The purpose of radiological postings, signs and labels is to identify items or areas that have the potential for, or actually contain, radiological hazards; identify the radiological hazard(s) present in an area and to prevent workers from inadvertently entering radiological area(s), and/or mishandling radioactive materials.

Each individual is responsible to read and comply with all the information identified on radiological postings, signs and labels. Since there may be more than one radiological hazard identified on a posting, sign or label, it is important to read all of the information and not just the first line.

All access points into an area must be posted to ensure workers are adequately warned of the hazards in the area. Postings and status boards (if applicable) should be promptly updated after completion of a survey to reflect the corrected conditions in the area.

If necessary, the RWP should be amended to reflect any changes in the area. The information on status boards, RWPs, posting and survey maps should be consistent. If there is a discrepancy it should be immediately corrected. Workers could review erroneous data that has not been updated and subsequently become contaminated or receive some unnecessary radiation exposure.

Radiological Control Technicians should immediately update postings after performing a survey. The RWP and any status boards must also be updated. If the posting was updated and the RWP was not, a worker may consider the RWP correct and the posting wrong. If a worker entered the area based on the incorrect RWP information he could become contaminated or receive some unnecessary radiation exposure.

Areas should be posted if there is a strong potential for the situation to exist, even if it is not now present. Areas can be posted as Airborne Radioactivity Areas or Surface Contamination Areas, if equipment in the area has been known to leak and create airborne or contamination hazards. Posting areas in such a situation will ensure that the proper protective equipment is used and could prevent a personnel contamination incident or a case of internal exposure.

If areas are posted only when the appropriate limits have been reached, personnel can be subjected to hazards when the hazard could have otherwise been minimized.

Disregarding any radiological posting, sign or label can lead to unnecessary or excessive radiation exposure and/or personnel contamination.

Unauthorized removal or relocation of radiological postings, signs and labels may lead to disciplinary actions up to and including job termination. If any type of material used to identify radiological hazards is found outside an RBA, it should be reported to radiological control personnel immediately. The RCT shall perform a survey of the sign, posting or label and conduct a survey of the area in which it was found.

Any contamination or higher than expected radiation levels must be promptly reported to the RCT supervisor.

TYPE OF RADIOLOGICAL POSTINGS, SIGNS AND LABELS

2.10.08 *Identify the following radiological postings at your site, requirements for posting/barriers, and requirements for entry:*

- a. *Radiological Buffer Area*
- b. *Radiation Area*
- c. *High Radiation Area*
- d. *Very High Radiation Area*
- e. *Hot Spot*
- f. *Surface Contamination Area*
- g. *High Surface Contamination Area*
- h. *Airborne Radioactivity Area*
- i. *Fixed Surface Contamination*
- j. *Soil Contamination*
- k. *Radioactive Material Storage Area*

Area designations

(Insert site specific information here)

Entry Requirements

(Insert site specific information here)

SETTING UP RADIOLOGICAL AREAS

2.10.09 *Describe good practices, support equipment to use, and common discrepancies in setting up radiological areas.*

Good practices to be considered whenever possible in setting up Radiological Areas: establish walkways in low dose areas; do not store radioactive materials near walkways or where personnel frequently work; place rope boundaries as close to the source of

contamination as possible to minimize the size of the contaminated area. Care must be taken to ensure the area is not so limited that contamination is easily spread across the boundaries.

Use drip trays or containment devices to prevent the spread of contamination. Establish laydown areas for equipment to limit personnel safety hazards and/or radiation exposure. Set up SOPs upwind of contamination hazards. Post all accessible sides and entrance(s) to areas containing radiological hazards.

Use Personnel Contamination monitors along with portable contamination survey instrumentation whenever possible. PCMs are more likely to detect contamination on individuals because personnel tend to survey too quickly. If this happened with an actual contamination incident the employee could subsequently pass over the contamination areas with the portable contamination survey instrumentation.

The following are commonly observed discrepancies that should be avoided in the setup of Radiological Areas:

- Posting information not updated or information otherwise incorrect.
- Boundaries not verified for contamination, radiation, and airborne radioactivity hazards.
- Survey instruments out of calibration or defective.
- Step-off-pads not set up for efficient removal of protective clothing (not enough room to prevent contaminating the SOPs).
- Laundry and waste receptacles not placed for efficient use or not placed at all. Receptacles not properly labeled as to their contents.
- Boundaries of areas setup too far from the hazards interfering with access to areas otherwise unaffected.
- Count rate meters not located close to the step-off-pads.
- Status boards do not reflect where SOPs and boundaries lie.
- Status board not kept up-to-date. The information on status boards, postings and RWPs should agree. Postings should be updated at least every 24 hours while an RWP is in use.

- Tripping hazards exist from wires, hoses, or cables.
- Background radiation in monitoring area too high for efficient detection of low level contamination.
- Portable contamination survey instrumentation not set up for proper operation.
- Protective clothing (gloves and booties) not readily available in a personnel contamination event.
- Phone or other communication devices not available near the SOP or portable contamination survey instrumentation.
- Not posting all accesses to the area.

Since contamination or airborne radioactivity and radiation levels are subject to change, it is essential to be able to quickly establish a Radiological Area. To properly set up a Radiological Area, the following support equipment should be readily available:

- Step-off-pads.
- Portable contamination survey instrumentation/personnel contamination monitors to establish at exits to Contamination Areas, Airborne Radioactivity Areas, and RBAs.
- Yellow and magenta rope, ribbon or tape.
- Laundry receptacles.
- Waste receptacles (clean and radioactive waste receptacles).
- Receptacles for defective protection clothing (optional).
- Receptacles for non-compactable waste (optional).
- Receptacles for mixed waste (optional).
- Electrical power supply and extension cords (optional).
- Postings, signs, labels, and posting inserts.

- Communication equipment readily available.
- Additional protective clothing.
- Dose rate meters and smears.
- Survey maps.

CONTAINMENT DEVICES

2.10.10 List discrepancies frequently observed in containment devices.

Containment devices include glove boxes, glove ports, hot cells, huts, and windbreaks. Common discrepancies observed in containment devices include:

- Holes/leaks in the containments, facilitating the spread of contamination.
- Liquids accumulating in hoses or main portions of the containment.
- Airlocks too small to remove protective clothing without spreading contamination.
- Ventilation exhaust not directed to the plant ventilation system.
- Material allowed to accumulate inside containments, limiting safe and/or efficient use.
- Sharp objects used inside containments.
- Devices not tethered to prevent introduction into systems.
- Transfer sleeves/ports are not used or are unavailable.
- Containment not provided with a HEPA filter or ventilation exhaust.
- Containments not periodically surveyed inside and out.
- No means of quickly verifying loss of ventilation.

- Containment not decontaminated prior to dismantling.
- Adequate access not provided for lines or hoses.
- Containment not maintained at a negative pressure.
- Containment not supported properly to minimize stress from minor ventilation changes or not structurally supported to maintain its configuration during use.
- Containments not inspected prior to use and periodically during use.
- Not using appropriate containment devices for leaks.
- Not using a funnel to collect leakage.
- Plastic components showing fatigue or wear.
- Funnel not positioned to collect all leaking fluid.
- Drain lines kinked allowing the buildup of liquids.
- Drain lines not secured properly to the collection device.
- Containment device not labeled to indicate hazards that are present.

PORTABLE VENTILATION SYSTEMS

Portable ventilation systems are frequently used to remove contaminated air or filter contamination in the air. Radiological control personnel should adhere to the following good practices in setting up portable ventilation systems.

2.10.11 Describe good practices in setting up portable ventilation systems and count rate meters.

Good practices to be used for the set-up of portable ventilation systems include:

- Use only HEPA (High Efficiency Particulate Air) filters with pre-filters (roughing filters).
- Perform radiation survey on filters periodically while in use.
- Have radiological limits established for filter replacement.
- Exhaust filter discharge to the plant ventilation system whenever possible.
- Ensure that there are no openings in the trunk or between the blower and the filter.
- Monitor the filter differential pressure (d/p) periodically.
- Establish filter d/p at which the filter must be replaced.
- Remove filters into plastic bags to prevent the release of activity.
- Position streamers to signify the flow of ventilation through doorways or through containment devices.

CONTAMINATION MONITORING EQUIPMENT

The proper setup and use of portable contamination survey instrumentation and personnel contamination monitors (PCMs) can ensure that contamination is more likely to be detected on workers. The following is a list of good practices for setting up portable contamination survey instrumentation and PCMs:

- They must be placed in low background area.
- They need reliable power supply.
- They should be positioned to facilitate easy access by workers.
- Alarms should be set to site administrative control levels or DOE limits.
- Must ensure instrument is source checked and calibrated.
- Extension cords must be checked for electrical safety.

- Portable contamination survey instrumentation and PCMs should be placed upwind of contaminated areas.
- They should not be placed near radioactive material storage areas or other areas where the background radiation can change.
- Portable contamination survey instrumentation should have sources provided to source check the instrument.

ACCESS CONTROL

To maintain personnel internal and external exposure ALARA, access to the RBA and Radiological Areas must be controlled. The following is a list of access control requirements for entries into Radiological Areas and RBAs that are enforced to maintain workers' exposure ALARA. These requirements are in addition to other requirements previously mentioned.

2.10.12 List the requirements individuals must follow while working in RBAs.

Entry and Exit Requirements for Radiological Buffer Areas

(Insert site specific information here)

Besides meeting the requirements for entry into Radiological Areas and RBAs, personnel must also ensure that they take appropriate measures to maintain their exposures ALARA.

- Workers who receive radiation exposures from other nuclear facilities must report the exposure to HP and their supervisor upon returning to the site.
- Avoid contact with potentially contaminated surfaces.
- Any management/supervision or HP personnel should give stop work or evacuation orders if unanticipated radiation or contamination is encountered or if the appropriate RWP is not being followed.
- Handle all tools and equipment properly inside RBAs.

- Wear dosimetry when required and in the prescribed locations.
- Maintain exposure ALARA.
- Report all injuries.
- Monitor clothing and exposed skin as required and report the presence of radioactive contamination.
- Place contaminated items and waste in the proper receptacles.
- Personnel should wash their hands when leaving the RBA and prior to eating or using tobacco products.
- Personnel who are not respiratory qualified shall not enter areas posted as "Respiratory Protection Required"

Entry Requirements for High Radiation Areas

Special access control measures are required in situations where high levels of exposure are possible. For example, one or more of the following features should be used for each entrance or access point to a High Radiation Area and shall be used for each entrance or access point to a High Radiation Area where radiation levels exist such that a person could exceed a whole body dose of 1 rem in any one hour:

- A control device that prevents entry to the area when high radiation levels exist or upon entry causes the radiation level to be reduced below that level defining a High Radiation Area
- A device that functions automatically to prevent use or operation of the radiation source or field while personnel are in the area
- A control device that energizes a conspicuous visible or audible alarm signal so that the person entering the High Radiation Area and the supervisor of the activity are made aware of the entry
- Entry ways that are locked, except during periods when access to the area is required, with positive control over each entry

- Continuous direct or electronic surveillance that is capable of preventing unauthorized entry
- A control device that automatically generates audible and visual alarm signals to alert personnel in the area before use or operation of the radiation source and in sufficient time to permit evacuation of the area or activation of a secondary control device that will prevent use or operation of the source.

In addition to the above requirements, additional measures shall be implemented to ensure personnel are not able to gain access to Very High Radiation Areas when dose rates are in excess of the posting requirements of RCM Table 2-3. Physical access controls over High and Very High Radiation Areas shall be established in such a way that does not prevent a person from leaving the area.

Hot Particles

Hot particles are small, discrete, highly radioactive particles capable of causing extremely high doses to a localized area in a short period of time. Hot particle contamination may be present or be generated when contaminated systems are opened or when operations such as machining, cutting or grinding are performed on highly radioactive materials.

- The Site-Specific Radiological Control Manuals usually define hot particles. Typically they are described as very small discrete particles capable of producing a shallow dose equivalent greater than 100 mrem in one hour.
- Special surveys in areas with the potential for hot particle contamination.
- Posting areas to specifically identify the presence of hot particles.
- Controlling access to hot particle areas should through a job-specific RWP. The following controls should be considered for inclusion on the RWP:
 - Periodic personnel monitoring during the work activity, at a frequency based on the potential magnitude of skin exposure
 - Additional Personal Protective Equipment and Clothing
 - Direct Radiological Control coverage during work or assistance during protective clothing removal
 - Use of sticky pads or multiple step-off pads.

- Personal Protective Equipment and Clothing used in hot particle areas should be segregated from other radiological protective equipment and clothing during laundering and surveyed prior to reuse.
- Response to hot particle skin contamination of personnel should include the following:
 - Immediate removal and retention of the hot particle for subsequent analysis
 - Analysis of the particle
 - Assessment of worker dose
 - Evaluation of work control adequacy.

REMOVING MATERIALS FROM RADIOLOGICAL AREAS

Facility operations require that radioactive material and non-radioactive material be removed from Radiological Areas, RBAs, and from the site. Prior to allowing this material to leave, important steps outlined in the procedures must be followed. The following guidance is taken from the procedures to protect the health and safety of individuals who may come in contact with or within close proximity to the materials.

2.10.13 *State the requirements for removing or releasing materials from any radiological area.*

Release to Radiological Buffer Area

(Insert site specific information here)

Release to Uncontrolled Areas

(Insert site specific information here)

SUMMARY

This lesson addressed radiological area support and access control. The areas covered included RWPs, radiological postings, setting up radiological areas, good practices and discrepancies commonly observed in setup of various portions of radiological areas, access control, and removing materials from radiological areas.

REFERENCES

1. Radiological Control Manual, DOE/EH-0256T